STATE OF VERMONT
PUBLIC SERVICE BOARD

Wind Generation Facility Sound Standard Rulemaking	))	May 11, 2017

COMMENTS OF THE VERMONT DEPARTMENT OF PUBLIC SERVICE REGARDING THE VERMONT PUBLIC SERVICE BOARD'S PROPOSED RULE 5.700 ON SOUND LEVELS FROM WIND GENERATION FACILITIES

The Vermont Department of Public Service ("Department"), by the Commissioner and through undersigned counsel, hereby submits the following comments concerning the proposed Rule 5.700 on Sound Levels from Wind Generation Facilities, filed by the Vermont Public Service Board ("Board") with the Vermont Secretary of State on March 17, 2017. These comments are additional to the written submissions the Department filed in this proceeding on October 24, November 12, December 12, 2016, January 17, February 3, and April 27, 2017.

The Department strongly supports the implementation of a general 42 dBA daytime and 35 dBA nighttime sound limit measured 100 feet from a non-participating residence, coupled with a setback requirement of ten (10) times a facility's height. These siting requirements reflect appropriate consideration of the aesthetic impacts of the sound emissions from wind generation facilities, particularly in light of the rural character of Vermont. That said, the Department urges the Board to revise the proposed rule to better enable enforcement through efficient and accurate compliance assessment.

COMMENTS

General Rule

The Department strongly supports the general sound limits and setback requirement contained in the proposed rule. The 42 dBA / 35 dBA sound limits and setbacks reflect a principled policy of prudent avoidance of the significant controversy that has attended the sound emissions of wind facilities sited in Vermont. The proposed sound limits and setback requirements are appropriately protective of the quality of life for Vermonters who must live near wind facilities that are sited in their communities.

The proposed rule strikes an appropriate balance between the prudent avoidance principle while providing an opportunity for developers to site appropriately-sized wind facilities within the State. The sound limits and setback requirements are appropriate for Vermont, and the Department supports both requirements as currently drafted in the proposed rule.

Compliance protocols

The Department has consistently advocated for the inclusion of rule protocols and methodologies that facilitate as much accuracy in determining facility-only sound levels as possible. Accurate facility-only sound level calculations are vital to ensuring that determinations of compliance with the rule are correct. The methodologies used to calculate those facility-only sound levels must therefore be clear and create confidence in the results for developers, regulators, and the public alike. The proposed rule creates a broad methodology for evaluating sound emissions from wind facilities prior to and after facility construction, relying on both rigorous pre-construction sound modeling and post-construction sound monitoring protocols. The Department advocated for the use of these protocols starting with its proposed rule submitted on October 24,

2016, and it continues to support the use of both today. The proposed rule does not, however, establish a specific protocol for determining ambient background sound levels during the post-construction sound monitoring program as part of the rule. Determining background sound levels is essential to calculating accurate facility-only sound levels as part of a monitoring program. The proposed rule should be amended to include a protocol for determining background sound levels. The Department also recommends that the proposed rule establish monitoring protocols that enable simultaneous monitoring at multiple locations and granular analysis of sound data.

The Department supports the proposed rule's requirement that all petitions to construct a facility with a capacity of above 50 kW must include a sound model that illustrates the proposed facility's expected maximum sound output. Board Proposed Rule, Mar. 17, 2017 ("Proposed Rule") § 5.705. The conservative assumptions and inputs into the sound model required in the proposed rule are consistent with the broader underlying prudent avoidance principle. Furthermore, the proposed rule's requirement that the sound model be updated both prior to facility construction and after comparison of modeled sound levels to those measured during post-construction monitoring is significant. Proposed Rule §§ 5.705(G), 5.706(C). Linking the sound model to real-world measured sound levels provides the Board and the public a more accurate and comprehensive understanding of a facility's sound emissions.

In past wind facility experiences, a pre-construction facility sound model was evaluated as part of the Board's review pursuant to 30 V.S.A. § 248. However, the model was not revisited or consulted after a certificate of public good was issued. In the same vein, post-construction sound monitoring was conducted without regard or reference to the sound model estimates. Under the proposed rule, the monitoring program results will be used to evaluate the accuracy of the sound model, and revisions to the model will be made if necessary. The sound model thus becomes a

useful tool in evaluating facility compliance throughout the life of the facility. Sound monitoring is required at least every five years during the life of the facility. Proposed Rule § 5.708(C). The results of a sound monitoring program will be applied to the sound model each time a monitoring program is conducted, and the model will be updated. The model can then identify residences of concern as variables in and around the facility change over time, e.g. degradation of facility infrastructure or changes in landscape, and adjustments to facility operation can be made if appropriate. Likewise, the sound model could be used as a diagnostic tool in response to a noise complaint lodged by a nearby resident. These features create increased accuracy and transparency during the continued regulatory oversight of the facility, and help to foster public confidence in compliance determinations.

The effectiveness of the modeling and monitoring program outlined in the proposed rule is predicated primarily on two critical metrics: accurate assumptions in the model and accurate facility-only sound calculations. The sound modeling assumptions outlined in the rule are conservative by design, and the model is therefore expected to yield sound level estimates that are higher than those monitored. Accuracy in the monitoring results, however, is critical to ensuring that the modeled sound levels reflect worst-case conditions around the facility.

Accurate facility-only sound level calculations are best made under monitoring conditions when high sound emissions are observed at the turbine source and low background sound conditions are present at a monitoring receptor site. While these conditions occur naturally in the environment, the ability to distinguish between sound levels caused by facility operation and ambient background sound levels is critical to calculating facility-only sound levels

The proposed rule includes no methodology for determining ambient background sound levels at a monitoring receptor site that can be compared to overall turbine-on sound levels. The

proposed rule instead requires that measurements be obtained during weather and other atmospheric conditions that would likely yield a favorable signal-to-noise ratio, enabling the monitoring expert to discern overall sound levels when noise from the turbine source is audible above background levels. Proposed Rule § 5.708(E). As the Department explained in its technical comments dated April 27, 2017 and at the May 4 workshop, identifying facility-only sound levels using the proposed rule's methodology is difficult because one cannot be sure whether the overall sound levels recorded have been contaminated by ambient background levels. *See* Department Comments, Apr. 27, 2017, Attachment 1. Inaccurately high facility-only sound levels could be calculated if the recorded overall sound levels are contaminated by ambient sound.

The risk of ambient contamination of overall sound levels increases as the separation between ambient background levels and the sound limit facility compliance is judged against decreases. In the case of the proposed rule, the odds of ambient background sound levels at a given receptor location coming close to or exceeding 35 dBA (the rule's nighttime sound limit) are greater when compared to an instance where compliance is measured again a higher sound limit. The inclusion of a clear methodology for determining background sound levels is therefore crucial to the enforceability of the proposed rule due to the relatively small difference between likely background levels at a monitoring location and the 35 dBA sound limit.

The Department has consistently advocated for the use of a turbine shutdown methodology to determine background sound levels at monitoring receptor sites.[1] Department Amended

[1] The proposed rule references the use of a turbine shutdown protocol in two places: § 5.708(C)(3)(b)(vii) outlines requirements for a monitoring plan the Department may propose in response to a noise complaint lodged with the Board. Under the subsection, such a plan is required to "[p]rovide a process for determination of facility-only sound" and that "background levels shall be determined by measurements taken with the facility's wind turbines shut down for a period of at least 30 minutes." However, this protocol may only be used "in the event that the monitoring cannot be performed pursuant to the meteorological requirements set forth in Section 5.708(E) of the rule due to prevailing

Proposed Rule, Nov. 16, 2016 ("Dept. Amended Proposed Rule"), § 5.706(E)(1). A turbine shutdown protocol affords greater accuracy in making facility-only sound level calculations when compared to the proposed rule's approach, especially when evaluating facility compliance against a 35 dBA sound limit. Background sound levels can be measured under a variety of weather and atmospheric conditions using a turbine shutdown method. These background levels can then be compared directly to overall sound levels recorded under substantially similar environmental conditions to arrive at accurate facility-only sound levels. The Department continues to strongly recommend that the Board adopt a turbine shutdown protocol as a central part of this rule.

A turbine shutdown protocol codified in the rule should enable the monitoring State agency to determine representative ambient background conditions at each of the post-construction monitoring receptor locations. These background conditions may then be compared to turbine-on sound levels under similar meteorological and environmental conditions. The monitoring agency should be given flexibility to limit the dataset used to determine compliance based on the expected ambient sound levels under particular conditions. For example, turbine shutdowns conducted during the night would likely establish background sound levels that are lower than those experienced during the daytime. Increased human and wildlife sounds during the day would likely result in higher ambient background readings. In this instance, the rule should allow for the monitoring agency, at its discretion, to limit its data analysis to overall sound levels recorded

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meteorological or environmental conditions at the time the complaint is filed and when the monitoring will take place." Likewise, § 5.708(E)(2) allows for turbine shutdowns to be used when "it may not be feasible to meet the wind speed operations criteria due to terrain features or limited elevation change between the wind turbines and monitoring locations." In both instances, turbine shutdowns are allowed as an alternative to the primary monitoring methodology. However, no objective triggers are outlined in the rule to make clear when a move to these alternatives are appropriate. This creates ambiguity in determining when a turbine shutdown protocol should be used to determine facility-only sound levels. The rule also does not specify a clear procedure outlining key components to a turbine shutdown protocol, including the number of shutdowns required or the duration of an alternative monitoring protocol. The rule should make a turbine shutdown methodology a central component of the primary monitoring protocol.

during nighttime hours if appropriate when compared to representative nighttime background levels. This flexibility could be achieved by recognizing that many of the detailed monitoring and data analysis decisions should be left to the discretion of the monitoring agency. The Department's November 16 amended proposed rule suggests that facility turbine shutdowns be conducted "in accordance with the requirements of its CPG." Dept. Amended Proposed Rule, § 5.706(E)(1). A CPG-specific approach to developing a turbine shutdown protocol allows the monitoring agency to provide input on how to best implement a turbine shutdown protocol that accounts for unique facility-specific conditions and the latest best practices in the acoustic monitoring field, while preserving an appropriate level of discretion for the monitoring agency.

The Department recommends that the Board couple a turbine shutdown protocol with an unattended monitoring and data filtering scheme consistent with its November 16 amended proposed rule. Dept. Amended Rule §§ 5.706, 5.707. The Board's proposed rule requires that sound measurements be taken only during weather conditions conducive to a favorable source-to-background ratio. Proposed Rule § 5.708(E). Measurements taken under the proposed rule would likely require in-person attended monitoring. The unattended monitoring program proposed by the Department has many of the same benefits of an attended program and more. Unattended monitoring is able to capture the same sound levels that would be recorded during an attended program. It can also capture sound levels that would meet the proposed rule's § 5.708(E) measurement requirements when attended monitoring is not conducted. The Department's proposal therefore creates a larger set of data from which to calculate facility-only sound levels. The use of a larger data set increases the accuracy of sound level calculations by reducing the chance of outlier data points having an outsized influence on the analysis.

The Department's proposed monitoring protocol supports the ability to monitor at multiple receptor sites around a facility simultaneously. The proposed rule's § 5.708(E) protocol allows for monitoring at only one site. Under the proposed rule, wind direction and speed, and other atmospheric variables dictate a limited area where monitoring may take place at a given time. On the other hand, the Department's proposed protocol allows for monitoring equipment to be set up at multiple locations and at the specific locations the proposed rule requires measurements to take place; namely 100 feet from non-participating residences. Monitoring at multiple locations allows for more granular modification of the preconstruction sound model required by § 5.706(C) of the proposed rule if appropriate. Monitoring at multiple locations is particularly helpful in Vermont where unique topographical features near a facility may create sound levels in certain areas that were not accurately estimated in the pre-construction modeling.

The Department suggests that the compliance data collection procedures in the proposed rule be further modified to apply data screens to recorded sound levels at the conclusion of a sound monitoring program if the Board adopts the monitoring protocols proposed by the Department above. The Board could either apply the proposed rule's § 5.708(E) measurement requirement screens to a recorded sound level data set, or the proposed rule could adopt the data organization, frequency-based filtering, and data analysis requirements outlined in § 5.707 of the Department's amended proposed rule. The Department's proposed data filtering requirements hold a number of advantages over those in the Board's proposed rule.

The Department's "binning" approach allows for a more granular assessment of facility-only sound levels. Binning calls for both ambient background and overall sound level data to be separated into one meter-per-second wind speeds (e.g. 0-1m/s, 1-2m/s, 2-3m/s, etc.) at the receptor site. Background sound levels from each bin are then subtracted from corresponding overall sound

levels. Binning reveals the presence of facility-only sound levels across a range of wind speeds, allowing the Board to better understand the wind conditions that drive worst-case facility sound levels at a particular monitoring location. This information could be useful in determining what modifications to facility operation may be appropriate if an exceedance of the sound limit is recorded.

The binning approach proposed by the Department contemplates using a one-minute LAeq monitoring interval, as opposed to the ten-minute intervals required in the proposed rule. The Department explained in its April 28 comments and at the May 4 workshop that the use of a shorter measurement interval better identifies contamination within the measurement period and reduces the risk of contamination creating inaccuracy in the facility-only sound level calculations.

Compliance determinations should be made using one-minute monitoring intervals once a defined set of data points meeting all data filters are collected. The Department suggests that the proposed rule specify that compliance determinations be based on a minimum of 120 filtered one-minute LAeq data points. Under a binning approach advocated by the Department, a minimum of 20 data points must be gathered in a particular wind bin in order to calculate facility-only sound levels. Amended proposed rule § 5.707(C)(1)(e)(i). This 20 data point minimum for each bin ensures that a sufficient data set exists for accurate statistical analysis. On the other hand, an overall 120 data point minimum may be applied to the proposed rule's § 5.708(E) monitoring requirements without further binning. All filtered data points could be averaged across all wind speeds up to six miles per hour, resulting in a single facility-only sound level calculation. Specifying an overall data point minimum in the proposed rule could result in significantly shorter monitoring programs when compared to scheduled weeks or months-long programs, provided that favorable monitoring conditions occur relatively early in the campaign.

Finally, the Department notes that its proposed monitoring protocol includes methodologies for identifying tonality in recorded sound levels, and for applying an appropriate additional decibel penalty pursuant to recognized industry standards when facility-induced tonal sounds are present at a monitoring location. Dept. Amended Proposed Rule, § 5.707(C)(2). Tonal sounds can be a significant factor in how an individual may be impacted by facility sound emissions. Recognition of tonal sound and provision for a means to incorporate the impact of that sound in compliance determinations is essential to a rule that seeks to protect residents near a facility. The Department's proposed methodology achieves both goals, and it should be considered for incorporation into the Board's proposed rule.

Economic impact of the proposed rule

At the Board's request, the Department provides the following assessment of the economic impact of the proposed rule. Assuming that the proposed rule is revised to include the Department's recommendations discussed above, the proposed rule should have a neutral or positive economic impact on the State when compared to the proposed rule as currently drafted. The unattended monitoring protocol advocated by the Department allows for simultaneous monitoring at multiple locations near a facility. Simultaneous monitoring would likely achieve significant cost reductions when compared to costs required to perform multiple monitoring campaigns under the proposed rule as currently drafted to calculate facility-only sound levels at more than one monitoring location. Likewise, implementation of an overall 120 data point calculation requirement enables monitoring programs to likely end earlier than those undertaken in the past at existing facilities. The programs may also end earlier than those under the proposed rule's protocol because sound level data will be recorded at all times, as opposed to only times

where the monitoring agency is available to conduct on-site monitoring when favorable conditions are present. The Department's proposed protocol also creates greater granularity in its data analysis, providing greater benefit to the State at a likely similar or reduced cost compared to the proposed rule's methodology.

Most importantly, the proposed rule still allows for appropriately located and scaled wind development within the State. The economic benefits that accompany wind industry activity would still be realized under the current rule, but that activity would be tempered by clear protections for Vermont residents and the State's landscapes.

Exemption from setback requirements for small facilities

Representatives from Star Wind Turbines suggested at the May 4 workshop that the Board consider adopting an exemption for small turbines from the ten-times turbine-height setback requirements contained in § 5.703(A).

An exemption for small turbines from the proposed rule's setback requirements is not appropriate. The proposed rule's setback requirement is keyed to turbine height, allowing for the siting of wind facilities that is mindful of the surrounding residential density. Wind facilities, including smaller turbines, should be sited in locations where there is sufficient space to adequately mitigate the sound emission impacts on nearby residents. The proposed rule's setback provision requires wind developers to select only appropriately-scaled technology at a given location with due regard for residential density in the surrounding area. The setback requirement is appropriate and should be applied to all facilities under the rule. No compelling data or rationale have been presented to justify the exemption Star Wind Turbines has suggested.

Dated at Montpelier, Vermont, this eleventh day of May, 2017.

Respectfully submitted,

VERMONT DEPARTMENT OF PUBLIC SERVICE

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